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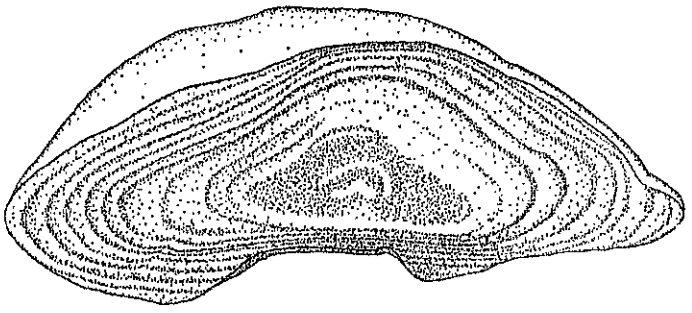
INVENTORY OF OTOLITH COLLECTIONS AND AGEING WORK ON NORTH EAST ATLANTIC DEEP WATER FISH SPECIES

by

PAUL L. CONNOLLY, CIARAN J. KELLY, JOHN D. M. GORDON AND ODD AKSEL BERGSTAD



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INVENTORY OF OTOLITH COLLECTIONS AND AGEING WORK ON NORTH EAST ATLANTIC DEEP WATER FISH SPECIES

by

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Department of the Marine Dublin 2.

SUMMARY

The results of a questionnaire sent to 38 institutes, indicate that a broad range of unpublished raw data exist on many of the deep water fish species in the north east Atlantic and Mediterranean. Of the 18 fish classified by ICES as 'primary' deep water species, one or more of the six *Coryphaenoides rupestris, Mora moro, Aphanopus carbo, Hoplostethus atlanticus, Phycis blennoides, Helicolenus dactylopterus* were common to most of the institutes which completed the questionnaire. Institutes which possessed some form of otolith or ageing data on these primary fish are grouped by species. A table of institutions which have some form of data on other deep water species (including sharks, rays and Chimaerids) is presented. A list of the main deep water species is given with their English, French, and Spanish common names. In general, there was a very positive response to the setting up of an otolith exchange scheme (by correspondence), as an initial approach to the convening of a deep water ageing workshop. The questionnaire did not provide any indications as to the extent or quality of the various data sets.

INTRODUCTION

During the 1980's there has been a dramatic increase in the exploitation of deep water species in the north east Atlantic, as traditional fish stocks decline. This exploitation has been driven by developing technology and the introduction of restrictive legislation on the more traditional fishing grounds. It is already established that the ecosystem in which these fish live is different from that of the continental shelf and many scientists believe that some of the deep water species currently exploited are relatively long lived, are slow to mature and have low fecundities. These characteristics make them especially susceptible to over-exploitation and have given rise to serious concerns within the scientific community. This has resulted in three international meetings over the past three years, concerned with the exploitation of deep water resources (EU Meeting on Deep Water Fisheries, Brussels, May 1993; Advanced Research Workshop on the Deep Water Fisheries of the North Atlantic Oceanic Slope, Hull, March 1994; ICES Study Group on the Biology and Assessment of Deep Sea Fisheries Resources, Copenhagen, August 1994). These meetings have recognised the need for the introduction of management measures based on sound biological data. It is clear that there is a dearth of published biological data for these species and much of the existing data is only available in a myriad of unpublished reports and raw data formats. Furthermore published data are often conflicting. It is against this background that these meetings have identified ageing as one of the high priority areas for future work.

In recent years the focus of deep water fish research has been shifting from exploration, species descriptions and distributions to studies on the life history, population dynamics and ecology of deep water fish (Bergstad, 1994). Age determination is a vital component of any life history study and is of paramount importance if we are to begin to unravel the biology of these species. Indeed, with the increasing exploitation of deep waters species, managers will require some form of stock assessments which will demand accurate age input data. There are several aspects to the age determination question which need to be addressed in any research programme. These include the selection of ageing structures which produce regular growth increments; the treatment and processing of these structures; intercalibration of age estimates, measurement of the precision of estimated ages and measurement of the accuracy of age estimations through age validation work.

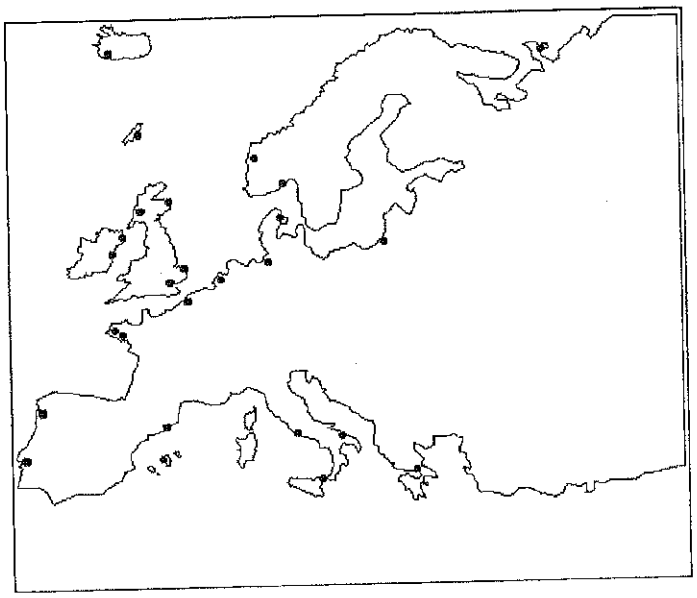
There is considerable interest in an EU Concerted Action on deep water fish ageing. However, given the limited published data and the unknown extent of relevant material, it was felt that this approach would require some initial groundwork in order to identify relevant institutes and data sets. Following informal discussions during the NATO Advanced Research Workshop in Hull (March 1994) it was decided to compile an inventory of otolith collections and ageing work on north east Atlantic deep water fish species.

This paper presents the results of a questionnaire sent to 38 institutes and provides an insight into the type of data available, with particular emphasis on ageing work and otolith collections for north east Atlantic deep water species.

METHODS

A questionnaire was circulated to 38 institutes in Greenland, Iceland, Norway, Russia, Greece, Germany, Italy, The Netherlands, UK, Ireland, France, Spain, and Portugal (Figure 1).

Figure 1. List of institutes which responded to the questionnaire (Madeira, Canaries and Azores not shown).



Institutes were selected from the list of participants at the EU Deep Water Meeting in May 1993 and from the Hull Deep Water Meeting in March 1994. The format of the questionnaire is shown in Appendix I, and the covering letter which was sent with each questionnaire in Appendix II.

The questionnaire requested participants to provide details of their institute (Sections A to D). Information on the type of scientific work (Work Type) and the nature of these data sets (Data Type), together with the Primary Species to which these data related (Section E to G).The keys for the "Data Type" and "Work Type" Sections are given below.

Data Type

1 = Catch per unit effort
2 = Depth distribution data
3 = Length frequency data
4 = Egg and larval data
5 = Juvenile fish data
6 = Otolith collections
7 = Age determinations

Work Type

EF = Experimental fishing
RVS = Research vessel surveys
CFS = Commercial fishing surveys

Institutes were asked if they would be prepared to participate in an otolith exchange scheme by correspondence (Section H) and for any comments they wished to make (Section I). The questionnaires were circulated during April 1994 and each institute was requested to respond by 17th June 1994. However, responses were received as late as December 1994.

Some institutes provided a detailed species list while others provided only family or common names. Where possible, scientific names were allocated to these species according to the nomenclature of Whitehead et al. (1984-1986), Cohen et al. (1990) and Compagno (1984).

On receipt of completed questionnaires, the approach was to screen the type of data (Section F) and the species list (Section G). Institutes which had some form of otolith or age reading data were grouped under common 'primary' species. Primary species were defined as those listed in the ICES Study Group Report (Anon. 1994) as 'most important in deep water fisheries'. A list of 'secondary' species and families, for which some form of data were available was also compiled from the data supplied in Section G. 'Secondary' species were defined as any species or family listed in Section G of the questionnaire, other than 'primary species'.

RESULTS

Of the 38 institutes contacted, 25 replied. Twenty completed questionnaires were received. Of those who completed the questionnaire, 19 indicated that they would be willing to participate in an otolith exchange scheme by correspondence. Thirteen institutes have otolith collections and age reading data, while 3 have otolith collections with no age readings. Two have age readings with no otolith collections. Fourteen institutes have data on the roundnose grenadier *Coryphaenoides rupestris*, 10 on morid cod *Mora moro*, 9 on black scabbard *Aphanopus carbo*, 6 on orange roughy *Hoplostethus atlanticus*, 6 on the greater forkbeard *Phycis blennoides*, and 5 on the blue-mouth rockfish *Helicolenus dactylopterus*. Table 1 lists the institutes which have otolith or age reading data on the primary species mentioned above. Data on other species were very sporadic.

Table 1. List of the institutes grouped according to available otolith and age reading data for primary deep water species.

C. rupestris	*M. moro*	*A. carbo*	*H. atlanticus*	*P. blennoides*	*H.dactylopterus*
Germany	Germany Faroes	Germany	Germany	Ireland	Ireland
Faroes	Ireland	Faroes	France (IFR)	Portugal (IPIM)	Portugal (IPIM)
France (IFR)	Spain (COC)	France (IFR)	UK (MAFF)	Spain (ICM)	Spain (CISC)
Ireland	Spain (CISC)	Ireland		UK (SAMS)	UK (MAFF)
Norway	Spain (ICM)	UK (SAMS)			
Russian Fed.	UK (SAMS)	UK (MAFF)			
Spain (CISC)					
UK (MAFF)					
UK (SAMS)					
UK (SOAFD)					

CISC = Institut D'Estudis Avancatas, COC =Centro Oceanografico de Canarias, IFR =IFREMER , IPIM =Instituto Portugues de Investigacao Maritima, ICM =Instituto Ciencas del Mar MAFF = Ministry of Agriculture Fisheries and Food, SAMS = Scottish Association for Marine Sciences SOAFD = Scottish Office, Agriculture and Fisheries Department,

The information extracted from the questionnaire is summarised in Table 2. Table 3 lists the secondary species on which institutes have some form of limited data sets. The fish listed in Table 3 are to species level or family level depending on the information contained in the relevant questionnaire. Those species listed in bold typeface in Table 3 are those which are included in the terms of reference of various ICES Working Groups.

Common data sets are evident and further efforts should be directed towards establishing species co-ordinators who will foster and encourage otolith exchanges work and compile data on their respective species as a prelude to some form of ageing workshop.

There are two features of the questionnaire results which warrant comment. Firstly, apart from a few cosmopolitan fish such as *P. blennoides*, *H. dactylopterus* and *A. carbo*, there seems to be a natural divide in the species composition of deep water fish between the southern areas (Spain, Portugal, Madeira, Azores) and other more northerly regions. Secondly, there is confusion over the usage of common names for even the more ubiquitous species. To avoid this problem this document has used scientific names exclusively. There was only one common name reported in the questionnaire that could not be associated with any form of scientific name, using the FAO and UNESCO species keys. Appendix III lists the Primary deep water species as given by the ICES study group report, with the common names reported in the questionnaire.

DISCUSSION

Bergstad (1994) has identified validation of age reading, intercalibration of readings and improvement of preparatory techniques for deep water species as a challenge for the future. While this paper does not address the question of age validation, the results will hopefully foster the establishment of an otolith exchange scheme (by correspondence) where intercalibration of readings (precision) and improvements of preparatory techniques can be explored as a prelude to some form of deep water ageing workshop. While no attempt has been made to group potential partners for future collaborative research, institutes with common data sets can be clearly identified. It is evident that there are enough interested parties with relevant data to justify the setting up of a number of otolith exchange schemes as a prelude to the holding of a workshop on the ageing of deep water species.

REFERENCES

Anon (1993) Deep water fisheries Commission of the European Communities *Commission Staff Working Paper SEC(93)* Brussels 10 November 1993

Anon (1994a) Deep water fisheries of the north Atlantic slope *Advanced Research Workshop Summary Report* Seafish report No.438

Anon (1994b) Report of the study group on the biology and assessment of deep-sea fisheries resources *ICES CM 1995/Assess:*4

Bergstad, O.A. (1994 In Press) Age determination of deep water fishes: experience, status and challenges for future research. *NATO ARW Deep Water Fisheries of the North Atlantic Oceanic Slope*. Hull, UK March 1994.

Cohen, D.M.; Inada, T.; Iwamoto, T and Scialabba, N (1990) FAO Species Catalogue, Vol 10. Gadiforms Fishes of the World (Order Gadiformes). Food and Agricultural Organisation of the United Nations (FAO), *FAO Fisheries Synopsis* No. 125, Vol 10, pp 442.

Compagno, L.J.V. (1984) FAO Species Catalogue. Vol 4, Part 1. Sharks of the World. Food and Agricultural Organisation of the United Nations (FAO), FAO Fisheries Synopsis No 125, Vol. 4, Part 1. pp249.

Whitehead, P.J.P., Bauchot, M. L., Hureau, J.C., Nielsen, J. and Tortonese, E. (1984,1986a,1986b) *Fishes of the North-eastern Atlantic and the Mediterranean*. Volumes 1-3, UNESCO, pp 1-1473.

Table 2

DENMARK		Otolith exchange	☐	Primary species	
Popp Madsen K.		Secondary species	☒	*C. rupestris*	
Danish Institute for Fisheries and Marine Research Charlottenlund Slot. DK 2920 Charlottenlund		Type of Data	1,2,3, 7		
		Type of Work	EF, RVS, CFS		
Tel.	+45-33963300	Fax.	+45-33963333	E-mail	
FAROES		Otolith exchange	☒	Primary species	
Reinert Jakup		Secondary species	☒	*C rupestris, M. berglax, C. monstrosa, A. carbo, M. moro*	
Fisheries Laboratory of the Faroes Noatun P.O. Box 3051 FR-110 Torshavn		Type of Data	1,2,3,6,7		
		Type of Work	EF,RVS,CFS		
Tel.	+298-15092	Fax.	+298-18264	E-mail	
FRANCE		Otolith exchange	☒	Primary species	
Du Buit Marie Henriette		Secondary species	☐	*H. atlanticus ,A carbo, C rupestris, M. moro*	
Laboratoire de Biologie Marine du College du France B.P.225 Concarneau		Type of Data	1,2,3,4,		
		Type of Work	EF, CFS		
Tel.	+33-98970659	Fax.	+33-98978124	E-mail	
FRANCE		Otolith exchange	☒	Primary species	
Dupouy Herve		Secondary species	☐	*C. rupestris*	
IFREMER 8 RueFrancois Toullec 56100 Lorient		Type of Data	1,2,3,5,6,7		
		Type of Work	CFS		
Tel.	+33-97877310	Fax.	+33-97834106	E-mail	
FRANCE		Otolith exchange	☒	Primary species	
Lorance Pascal		Secondary species	☐	*H.atlanticus ,C. rupestris, A.carbo*	
IFREMER 150 Quai Gambetta B.P. 699 62321 Bulogne sur Mer		Type of Data	1,2,3,6,7		
		Type of Work	EF		
Tel.	+33-21995610	Fax.	+33-21995601	E-mail	plorance@ifremer.fr

Table 2 cont.

GERMANY

Stehmann M.

Bundesforschungsanstalt fur Fischerei
Institut fur Seefischerei,
Palmaille 9 D-22767,
Hamburg

Tel. +49-40-38905217 Fax. +49-40-38905263

Otolith exchange ☒
Secondary species ☒

Type of Data: 2,3,5,6,7

Type of Work: EF, RVS, CFS

Primary species: *C. rupestris, M. berglax, M. moro, A. carbo, H. atlanticus, C. monstrosa, Squaloid shark spp*

E-mail: us@sprint.com

HOLLAND

Henk Y.L. Heessen

Netherlands Institute for Fisheries Research
Haringkade 1
P.O. Box68
1970 AB Ijmuiden

Tel. +31-2550-64646 Fax. +31-2550-64644

Otolith exchange ☒
Secondary species ☒

Type of Data: 3,7,8

Type of Work: EF,CFS

Primary species:

E-mail: henkh@rivo.agro.nl

ICELAND

Magnusson Jutta

Hafrannsoknastofnunin
Marine Research Institute,
Skulagata 4

Tel. +354-1-20240 Fax. +354-1-20240

Otolith exchange ☒
Secondary species ☒

Type of Data: 1,2,3

Type of Work: EF,RVS,CFS

Primary species: *D. calceus, E. princeps, E. spinax, C. squamosus, C. crepidater, C. coelolepis, M. berglax, C. rupestris, A. bairdi, H. atlanticus, A. carbo,*

E-mail:

IRELAND

Connolly Paul

Fisheries Research Centre
Abbotstown,
Dublin 15

Tel. +353-1-8210111 Fax. +353-1-8205078

Otolith exchange ☒
Secondary species ☒

Type of Data: 1,2,3, 5,6,7

Type of Work: EF, CFS

Primary species: *C rupestris, A. carbo, C.monstrosa H. dactylopterus, A bairdi, P. blennoides, M. moro*

E-mail: connolly@frc.ie

ITALY

Dr. Grico de costa francesco

Instituto Magistrale "Biazza" Messina
Via Catania, 40
98100 Messuna Italy

Tel. + 39-90-359631 Fax. +39-90-718583

Otolith exchange ☐
Secondary species ☒

Type of Data: 5, 6

Type of Work:

Primary species:

E-mail:

Table 2 cont.

NORWAY	Otolith exchange	☒	Primary species		
Bergstad Odd Aksel	Secondary species	☒	*C. rupestris*		
Institute of Marine Research P.O. Box 1870 Nordnes, N-5024 Bergen, Norway	Type of Data	1,2,3,4,5,6,7			
	Type of Work	RV			
Tel. +47-55238500	Fax. +47-55238531		E-mail		

PORTUGAL	Otolith exchange	☒	Primary species		
Figueiredo Maria Jose	Secondary species	☒	*H. dactylopterus, P. blennoides, D. Calcea, C. monstrosa,*		
Instituto Portugues de Investigacao Maritima Auendia Brasilia 1400 Lisboa	Type of Data	1,2,3,6,7			
	Type of Work	RVS			
Tel. +51-1-610814	Fax. +351-1-615948		E-mail		

PORTUGAL	Otolith exchange	☒	Primary species		
Biscoito Manuel Jose	Secondary species	☐	*A. carbo, B. splendens, M. moro, H. dactylopterus,*		
Museu Municipal da Funchal Rua da Mouraria, 31 9000 Funchal Maderia	Type of Data	2,5,6			
	Type of Work	EF, RVS,			
Tel. +351-91-229761	Fax. +351-91-225180		E-mail	biscoito@dragoeiro.uma.	

RUSSIAN FEDERATION	Otolith exchange	☒	Primary species		
Baidalinov A. P.	Secondary species	☐	*C. rupestris, B. splendens*		
AtlantNIRO 5 Dm. Donskoy str., Kaliningrad, 236000	Type of Data	1,2,3,6,7			
	Type of Work	EF,RVS,CFS			
Tel. +7-112-215645	Fax. +7-112-219997		E-mail	root@atlant.koenig.su	

SPAIN	Otolith exchange	☒	Primary species		
Morales-Nin Beatriz	Secondary species	☒	*C rupestris, M. moro, H. dactylopterus*		
CSIC Institut D'Estudis Avancatas Illes Baleras Carretera Valldemossa KM 7.5, 07071 Palma de Mallorca	Type of Data	2,3,6,7			
	Type of Work	RV			
Tel. +34-71401877	Fax. +34-71404945		E-mail	ieabmn@ps.uib.es	

Table 2 cont.

SPAIN

Santamaria Ma. Teresa Garci

Centro Oceanografico de Canarias
38080 Santa Cruz de Tenerife
Islas Canarias

Tel. +34-22-549400 Fax. +34-22-549554

Otolith exchange ☒
Secondary species ☐

Type of Data: 1,2,3,6,7

Type of Work: RV

Primary species: *M. moro*

E-mail: mtgs@ca.ieo.es

SPAIN

Francisco Sarda

Instituto Ciencias del Mar
08039 Barcelona

Tel. +34-3-2216416 Fax. +34-3-2217394

Otolith exchange ☒
Secondary species ☒

Type of Data: 2,3,6,7

Type of Work: EF, RVS

Primary species: *P. blennoides, M. moro*

E-mail:

UK

Merrett Nigel

The Natural History Museum
Cromwell road,
London SW7 5BD

Tel. +44-71-9389430 Fax. +44-71-9389158

Otolith exchange ☒
Secondary species ☒

Type of Data: 1,2,3,4,5,6

Type of Work: RVS

Primary species: *Squaloid sharks, C .monstrosa, A. bairdi, M. moro, P. blennoides, C. rupestris, H. atlanticus*

E-mail: nmerrett@nhm.ac.uk

UK

Gordon John

Scottish Association for Marine Science
Dunstafnage Marine Laboratory
P.O. Box 3
Oban PA34 4AD, Argyll

Tel. +44-631-62244 Fax. +44-631-65518

Otolith exchange ☒
Secondary species ☒

Type of Data: 1,2,3,5,6,7

Type of Work: EF,RVS

Primary species: *C rupestris, M. moro, A. bairdi, A. carbo, P. blennoides, C. squamosus, C. coelolepis, D licha, D. calcea, E spinax*

E-mail: jdmg@dml.ac.uk

UK

Hislop John

SOAFD Marine Laboratory
Victoria road
Aberdene A89 8DB

Tel. +44-224-876544 Fax. +44-224-295511

Otolith exchange ☒
Secondary species ☒

Type of Data: 6

Type of Work: EF

Primary species: *P. blennoides, M. moro, A bairdi*

E-mail:

Table 2 cont.

UK	Otolith exchange	☒	Primary species
Jones Brian (Retired)	Secondary species	☐	*C. rupestris, H. atlanticus, A. bairdi, A. carbo, D. licha, D. calcea, C. coelolepis, C. squamosus*
MAFF Fisheries Laboratory Lowestoft Suffolk NR33 0HT	Type of Data		
	1,2,3,6,7		
	Type of Work		
Tel. +44-502-562244 Fax. +44-502-513865	EF,RVS		E-mail

Table 3 Secondary species

	D	Dk	Es	Es	Fe	Ic	Ire	N	Nl	P	UK	UK	UK
	Institut fur Seefischerei	Danish Institute for Fisheries and Marine Research	CISC Instituto D'Estudias Avancatas Illes Baleras	Instituto Ciencas del Mar	Fisheries Laboratory of the Faroes	Marine research Institute	Fisheries Research Centre	The Institute of Marine Research	Netherlands Institute for Fisheries research	Instituto Portuguese de Investigacaco Maratima	The Natural History Museum	SAMS	SOAFD
Alepocephalus rostratus													
Argentina silus													
Bathypterois mediterraneus													
Brosme brosme													
Coelorhyncus coelorinchus													
Conger conger													
Galeus melastomus													
Hippoglossus hippoglossus													
Hoplostethus mediterraneus													
Lepidion eques													
Lepidion lepidion													
Lophius budegassa													
Lophius piscatorius													
Molva dypterygia													
Molva molva													
Nezumia aequalis													
Phycis phycis													
Reinhardtius hippoglossoides													
Sargocentron hausatus													
Sebastes mentella													
Trachyrincus scabrus													
Aphyonidae													
Apogonidae													
Bathylagidae													
Bathytidae													
Berycidae													
Callyonimidae													
Caproidae													
Chaulionimidae													
Chimaeridae													
Gadidae													
Gonosomatidae													
Halosaurdae													
Hexanchidae													
Ipnopidae													
Liparidae													
Macrouridae													
Malacosteidae													
Merluccidae													
Moridae													
Myxinidae													
Nettastomatidae													
Notocanthaidae													
Notosudidae													
Ophidiidae													
Oreosomatidae													
Pleuronectidae													
Rajidae													
Rhinochimaeridae													
Scophthalmidae													
Scorpaenidae													
Scyliorhinidae													
Sernivomeridae													
Soleidae													
Squalidae													
Stomiidae													
Synaphobranchidae													
Synodontidae													
Triglidae													
Zoarcidae													

Appendix I The questionnaire sent to each institute

Inventory of otolith collections and ageing work carried out on north east Atlantic deep water fish species.

A Name of Institute

B Address

C Phone Number
Fax Number
E-Mail

D Contact Name

E Has your institute carried out any scientific or other type of work on deep water species in the north east Atlantic. If so, please tick the appropriate box.

	YES	NO
Experimental fishing	☐	☐
Research vessel surveys	☐	☐
Commercial fishing surveys	☐	☐
Other work (please specify)		

F Please indicate the type of data your institute has collected on Deep Water fish species in the north east Atlantic.

	YES	NO
1 Catch per unit effort data	☐	☐
2 Depth distribution data	☐	☐
3 Length Frequency data	☐	☐
4 Egg and Larval data	☐	☐
5 Juvenile fish data	☐	☐
6 Otolith Collections	☐	☐
7 Age determinations	☐	☐
8 Other Information (Please Specify)		

G Please indicate the deep water fish species your institute has collected data on

Species	Type of Data (Use Numbers from Previous Box)

(Continue on a separate sheet if necessary)

H As a prelude to a Deep Water Ageing Workshop, would your institute be willing to participate in an otolith exchange scheme by correspondence.

I Any other Comments

J Please Complete this Form and return it, before 17th June 1994 to

Dr Paul L. Connolly,
Fisheries Research Centre,
Abbotstown, Dublin 15,
Ireland.

Appendix II The covering letter sent to each institute with the questionnaire.

REF. Inventory of otolith collections and ageing work carried out on north east Atlantic deep water fish species.

Dear Colleague,

As you are no doubt aware, there is now a great deal of interest in the exploitation of deep water fish species in the waters of the north east Atlantic (including the Mediterranean) and several countries are now actively engaged in the exploitation of this fishery. However, very little is known about the biology of these deep water species and extant information is widely spread in a myriad of published literature and unpublished reports. At the recent Advanced Research Workshop on Deep Water Fish Species, held at Hull, UK in March 1994, various aspects of the commercial exploitation and biology of deep water species were presented and discussed. It became clear through these discussions that very little published work exists on the **ageing** of deep water species in the north east Atlantic. Such information is of paramount importance if a proper EU management plan is to be set in place for the sustainable exploitation of the deep water fish stocks.

Following the EU meeting of experts which was held in Brussels in June 1993, John Gordon sent a letter to each participant and others, with the suggestion that an application be made for a EU Concerted Action on ageing. Although there was an encouraging response, he decided to shelve the idea until after the NATO Workshop. At the NATO Workshop John Gordon, Odd-Aksel Bergstad and I agreed to form a steering group to try and set up a Workshop in 1995. We decided that as a prelude to such a Workshop, the compilation of an inventory of otolith collections and age determination work which has been carried out in various research institutes around the waters of the north east Atlantic would be of enormous benefit to such a Workshop. The information collected would clearly identify and group institutes and workers who have data and/or expertise in the ageing of deep water fish species.

I have therefore enclosed a questionnaire which I hope you will take the time to complete yourself or pass on to an appropriate work colleague. The information collected from this questionnaire will be compiled into a report and circulated to all the institutes who participate in the survey. The next phase will be to set up several otolith exchange schemes between institutes, by correspondence, in order to compare and discuss ageing methods for particular species.

I would, therefore, be grateful if you would complete the enclosed questionnaire and return it to me before 17th June 1994.

Thank you for your co-operation and time.

Yours faithfully,

Dr Paul L. Connolly,
FRC, Fish Stock Assessment Group.
Demersal Section.

APPENDIX III

Names of Primary Deep Water Species

Scientific name	common name		
	English	French	Spanish
Alepocephalus bairdii	smoothhead slickhead		
Aphanopus carbo	black scabbard	sabre noir	sable negro
Argentina silus	greater argentine atlantic argentine	grande argentine	sila
Beryx decadactylus	red bream alfonsino	berix	palometa roja
Beryx splendens	golden eye perch	berix rouge	besugo americano
Chimaera monstrosa	rabbitfish	chimere	quimera
Coryphaenoides rupestris	roundnose grenadier	grenadier du roche	granadero
Epigonus telescopus	big eye deep water cardinal fish	pomatone telascope	pez diablo
Helicolenus dactylopterus	bluemouth rockfish blackbelly rosefish	racasse du fond	racasio rubio
Hoplostethus mediterraneus	silver roughy mediterranean slimehead	hoplostete argente	reloj mediterraneo
Hoplostethus atlanticus	orange roughy	empereur	emperador
Lepidopus caudatus	silver scabbard	sabre argente	pez cinto
Macrourus berglax	roughhead grenadier	grenadier gris	granadero de roca
Mora moro	morid cod deep water cod	mora	mollera moranella
Pagellus bogaraveo	blackspot seabream red seabream	dorade rose	goraz
Phycis blennoides	greater forkbeard	mostelle du fond	brotolo de fango
Polyprion americanus	wreckfish	cernier	cherna
Trachyrincus scabrus *(Trachyrhynchus trachyrhynchus)*	roughnose grenadier mediterranean longsnout grenadier		
Centrophorus squamosus	leafscale gulper shark	squale chagrin	quelvacho negro
Centroscyllium fabricii	black dogfish	squale megre aiguliat noir	tollo negro
Centroscymnus coelolopis	portuguese dogfish	siki pailona commun	pailona
Centroscymnus crepidater	longnose velvet dogfish	pailona a long nez	sapata negra
Dalatias licha	kitefin shark darkie charlie	squale liche gatte	carocho
Deania calceus *(Deania calcea)*	birdbeak dogfish	squale savate	tollo pajarito sapata
Etmopterus princeps	greater lantern shark	sagre rude	
Etmopterus spinax	velvet belly black spiny shark	sagre commun	negrito
Scymnodon ringens	knifetooth dogfish	squale-grogneur (commun)	bruja